***CLAIM SET AS AMENDED*:**

1. (Currently Amended) A control system for controlling a plant having an operating characteristic which describes the translation of a plant input to a plant output, wherein the plant operating characteristic has a linear component and a non-linear component, the control system comprising:

a feedback control function; and

a feed-forward control function,

wherein a demand signal is simultaneously applied to respective inputs of the feedback and feed-forward control functions, and respective outputs of the feedback and feed-forward control functions are summed together to generate the plant input, the feed-forward control function having a first component which is a function of a model of the linear component of the plant characteristic, and a second component which is an adaptive function to compensate for the non-linear component of the plant characteristic, the adaptive function being substantially modeled on the non-linear component of the plant characteristic and having adaptive laws which vary parameters of the adaptive function with time such that the adaptive function approaches the non-linear component of the plant characteristic, and

wherein the plant is a permanent magnet linear motor (PMLM) wherein the feedback control function is a Proportional/Integral/Derivative (PID) controller.

2. (Currently Amended) The control system of claim **1** wherein the non-linear component of the plant characteristic is of the form:

$u_{ripple} = A(x)\sin(\omega x + Ø) = A_1(x)\sin(\omega x) + A_2(x)\cos(\omega x)$,

where x is the plant variable,

and where the adaptive function has the form:

$u_{AFC} = a_1(x(t))\sin(\omega x) + a_2(x(t))\cos(\omega x)$,

where

$\cancel{a_1(x(t)) = -ge\sin(\omega x)}$, $\underline{\dot{a}_1(t) = -ge\dot{x}_d\sin(\omega x)}$,

$\cancel{a_2(x(t)) = -ge\sin(\omega x)}$, $\underline{\dot{a}_2(t) = -ge\dot{x}_d\cos(\omega x)}$,

e is an error signal given by:

$e = (x_d - x)$,

g is an adaptation gain and is greater than 0, x_d is the desired function of the plant variable and ω is related to 1/period of the non-linear component of the plant characteristic, such that the adaptive feed-forward control function continuously adjusts the parameters a_1 & a_2 in response to the error signal e.

3. (Previously Presented) The system of claim **2,** wherein the plant variable x represents an instantaneous position of a translator of the linear motor, the desired function of the plant variable x_d represents the desired trajectory of the translator and the PMLM has a magnetic structure having a pole pitch x_p, such that $\omega = 2\pi / x_p$.

4. (Currently Amended) The system of claim 3 wherein the adaptation gain has a value which is greater ~~that~~ <u>than</u> zero and less than or equal to one.

5. (Original) The system of claim 4 wherein the adaptation gain has a value which is less than 0.6.

6. (Original) The system of claim 5 wherein the adaptation gain has a value which is greater than or equal to 0.2.

7. (Original) The system of claim 6 wherein the adaptation gain is equal to 0.2.

8. (Canceled)